The New York Times https://www.nytimes.com/2020/03/20/health/coronavirus-data-logarithm-chart.html

A Different Way to Chart the Spread of Coronavirus

Those skyrocketing curves tell an alarming story. But logarithmic graphs can help reveal when the pandemic begins to slow.

By Kenneth Chang

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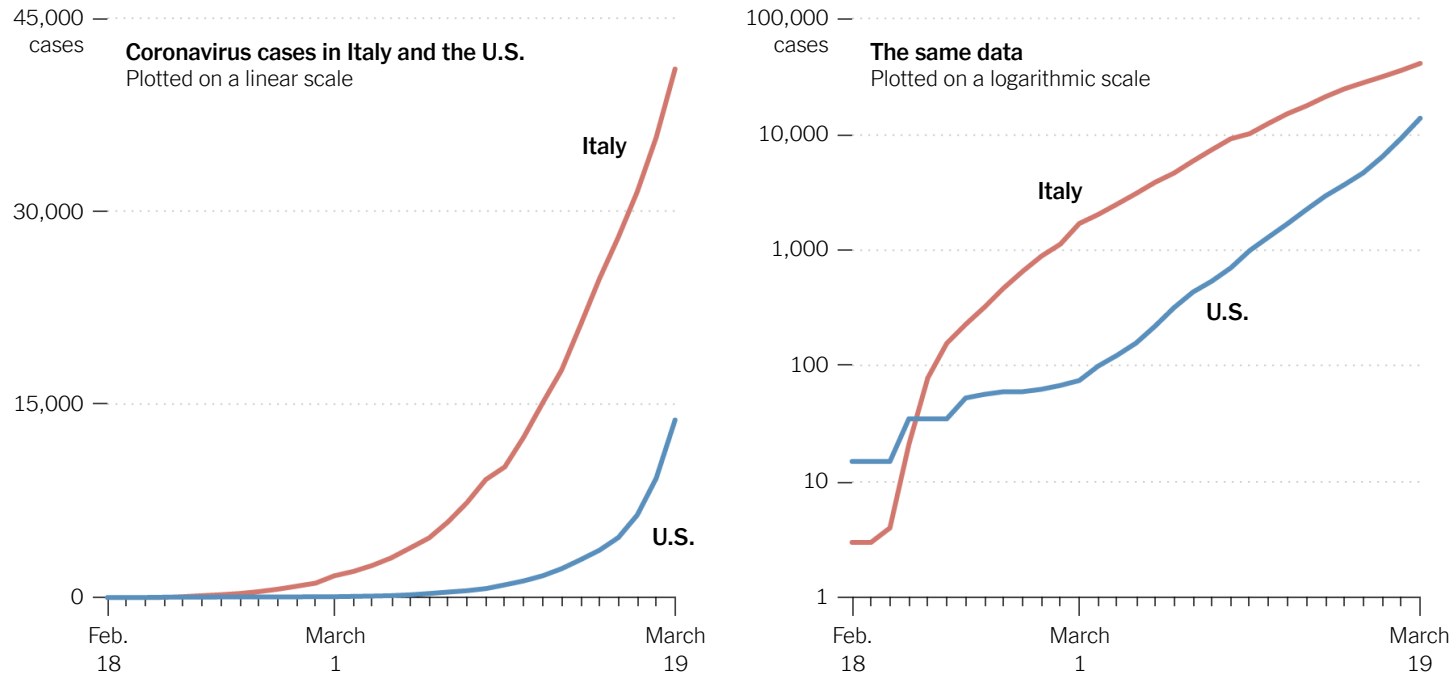
The arc of coronavirus cases in Italy is frightening, continuing to jump by hundreds each day. But a public-health official looking at those numbers will see definite signs that the nationwide lockdown, imposed to keep individuals apart and the virus from spreading, is working.

The data look very different when plotted on what is called a logarithmic scale. In a typical graph, values on the (vertical) y-axis are plotted linearly: 1, 2, 3, and so on, or 10, 20, 30, or the like. By contrast, in a logarithmic plot, each tick on the *y*-axis represents a tenfold increase over the previous one: 1, then 10, then 100, then 1,000, then 10,000 and so on. (The interval doesn't have to be a factor of 10, it could be a factor of 2, or 5, or 27, or any other number, but humans seem to prefer factors of 10.)

Bending the Curve

Logarithmic scales can emphasize the rate of change in a way that linear scales do not. Italy seems to be slowing the coronavirus infection rate, while the number of cases in the United States continues to double every few days.



By The New York Times | Data from Worldometer

Unconstrained, the coronavirus spreads exponentially, the caseload doubling at a steady rate. That curve, plotted linearly, is a skyrocketing curve. Plotted logarithmically, however, it transforms into a straight line — which means that deviations from the exponential spread of the virus become much easier to discern.

Presented this way, the data for Italy clearly show that the infection rate is no longer exponential. The straight line is now a slight downward curve indicating that the rate of increase is slowing.

At a quick glance, the rate of spread in the United States looks similar to Italy's, at least when plotted on a linear scale. But on a logarithmic scale, it is instantly apparent that the number of Americans becoming infected continues to double every three days or so. That indicates that the limited measures taken until recently did not sever social contact enough to slow the spreading. The U.S. curve has even bent upward in the last few days — an even faster exponential growth — perhaps reflecting more widespread testing.

Italy's experience shows that more drastic containment measures work, so the U.S. curve may start bending downward in the coming days, as measures here go into effect. (John Burn-Murdoch at The Financial Times maintains a log chart for multiple countries.) The lag between the imposition of measures and their impact on the curve could take days to a week or two, because of the incubation time before symptoms arise. If the line does not begin to bend downward, more stringent actions are probably needed.

But when it finally does, it will herald a real change in the direction of the epidemic in the United States.

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